

Claims

What is claimed is:

1. Method of charging a rechargeable device, comprising the following steps:

- 5        a) connecting the rechargeable device to a battery connection port and ground;
- b) feeding a current reference value to a control unit;
- 10        c) feeding a voltage reference value to the control unit;
- d) determining a duty cycle in accordance with the current reference value and the voltage reference value fed to the control unit;
- 15        e) switching, using the duty cycle, an output voltage applied to the rechargeable device between a minimum output voltage and a maximum output voltage dependent on the current reference value and the voltage reference value by means of a charging switch; and
- 20        f) disconnecting the charged rechargeable device; wherein the method further comprises the following step:
  - g) connecting an external DC source having an input voltage to an input resistor of a charging apparatus, wherein a transistor voltage drop across the charging switch is minimized in order to reduce a power dissipated by the charging switch -transistor; and that, in step e),
  - 25        h) the duty cycle provided by the control unit is determined by the input voltage and the charging state of the rechargeable device.

2. Method of charging a rechargeable device according to claim 1, wherein a soft switching using the transistor is provided to avoid electromagnetic interference problems.

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3. Method of charging a rechargeable device according to claim 1, wherein an average output voltage between a minimum output voltage and a maximum output voltage is applied to the rechargeable device.

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4. Method of charging a rechargeable device according to claim 1, wherein charging voltages above a voltage level as specified by battery manufacturers for a specific rechargeable device are avoided.

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5. Method of charging a rechargeable device according to claim 1, wherein power dissipated by the input resistor exceeds the power dissipated by the transistor to reduce the power dissipated inside the charging apparatus.

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6. Charging apparatus for charging a rechargeable device, including:

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a) a battery connection port for connecting the rechargeable device to the charging apparatus;

b) a control unit for the determination a duty cycle in accordance with a current reference value and a voltage reference value fed to the control unit; and

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c) a charging switch for switching according to the duty cycle, an output voltage applied to the rechargeable device between a minimum output voltage and a maximum output voltage

dependent on the current reference value and  
the voltage reference value,

wherein the charging apparatus further comprises:

- d) an input resistor for connecting an external  
5 DC source having an input voltage to the  
charging apparatus, wherein
  - i) a transistor voltage drop across the  
charging switch is minimized in order to  
reduce a power dissipated by the charging  
10 switch -transistor;
  - ii) the input resistor is installed separately  
from the charging apparatus to deposit  
the power dissipated by the input  
resistor outside the charging apparatus;  
15 and
  - iii) the duty cycle provided by the control  
unit is determined by the input voltage  
and the charging state of the  
rechargeable device.

20 7. Charging apparatus for charging a rechargeable device  
according to claim 6, wherein the charging switch is a  
transistor.

25 8. Charging apparatus for charging a rechargeable device  
according to claim 6, wherein the charging apparatus is  
connectable to a commercial AC adapter.

30 9. Charging apparatus for charging a rechargeable device  
according to claim 6, wherein the external DC source  
having an input voltage which is connected to an input  
resistor of a charging apparatus is a car battery.